7 Jan 2009  

Test writing exercise – exemplar for Std 21: Measure and manipulate physical quantities and handle uncertainty in experimental results

From AWIS scheme of work:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Curriculum standard | | Time allocation | Activities | Key verbs | Bloom’s level |
| 21.1 | Be familiar with fundamental and derived SI units and **use** appropriate prefixes, **manipulate** ranges of magnitude and **express** quantities correctly in standard form in SI format. | 1 hour | **Tabulate** objects of differing sizes from a proton to the Milky Way galaxy and **indicate** the size using the appropriate SI unit of measurement. **Convert** measurements from one unit to another, **expressing** the result in standard form. | **Tabulate** | Knowledge |
| **Indicate** | knowledge |
| **Convert** | comprehension |
| **Express** | comprehension |
| **use** | application |
| **manipulate** | application |
| 21.2 | **Distinguish** between precision and accuracy; **know how to ensure** both in physical procedures. | 1 hour | **Use** a micrometer screw gauge to **measure** length and an electronic timer to **measure** time intervals precisely to a known margin of error. Repeat the measurements and **take a mean** to ensure accuracy. | **Use** | Application |
| **Measure** | Application |
| **take a mean (= calculate)** | Application |
| **know how to (= describe/retell)** | comprehension |
| 21.4 | **Distinguish** between vector and scalar quantities, **manipulate** them appropriately and **interpret** their meaning. | 1 hour | Use examples in this and subsequent grades to **show**:  • the addition and subtraction of vectors;  • the representation of vectors by lines;  • (advanced) the resolution of vectors into perpendicular components and their addition by the method of components. | **Distinguish** | comprehension |
| **Manipulate** | application |
| **Interpret** | comprehension |
| **show** | knowledge |
|  |  |
| 21.3 | Use and understand simplifying assumptions made in solving problems. |  | Not taught |  |  |

**Matrix of question hierarchy**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| standard | knowledge | comprehension | application | Proportion of marks |
| 21.1 | ✓ | ✓ | ✓ | 33.3% |
| 21.2 | 🗶 | ✓ | ✓ | 33.3% |
| 21.4 | ✓ | ✓ | ✓ | 33.3% |
|  | | | total | 100% |

**Setting the questions –** proportion of marks should reflect the time student spends answering the question as well as the order of thinking required

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| topic | Weighting determined by yourself | Question number | | | | | | | Total marks |
|  |  | 1 a knowledge | 1b  knowledge | 2  knowledge | 3 a  application | 3 b  comprehension | ….. | ….. |  |
| 21.1 SI units | 33.3% | 3 | 3 | 3 | 2 | 2 |  |  | Up to 20 – you decide |
|  | 33.3% |  |  |  |  |  |  |  |  |
|  | 33.3% |  |  |  |  |  |  |  |  |
| total | 100% |  |  |  |  |  |  |  | 60? |

**Test - a start**

Materials: ruler, calculator

**Question 1**

(list of values, may be expressed using prefixes or in standard form. You may include extra, inappropriate values)

1. Use the list above to match the appropriate size value with each of the objects below:
2. Distance of the Earth from the Sun
3. Height of a person
4. Diameter of a virus

(iv) radius of the Milky Way Galaxy

(v) the wavelength of visible light

….. etc ***max 3 marks, deduct half for each incorrect answer***

1. Express the following in standard form:
2. 500 mm
3. 0.02 s
4. 63.5 km
5. …. etc ***max 3 marks, deduct half for each incorrect answer***

**Question 2**

Match each quantity with the appropriate SI unit (you may use a unit more than once, or not at all)(key list of SI units, include inappropriate extras)

1. Force
2. Velocity
3. Energy
4. Electrical current
5. Time
6. …. etc ***max 4 marks, deduct half for each incorrect answer***

**Question 3**

Here is a micrograph of a single salt crystal as seen under a light microscope. The specimen in the photograph has been magnified 250X.



1. Use your ruler to measure one of the sides of the crystal. Draw a line on the photograph to indicate where you took your measurement.

Record the value here (include an appropriate unit):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Line matches value recorded = 1 mark***

***Unit appropriate (mm or cm, or m in standard form) = 1 mark***

1. Determine the actual length of the specimen. Show your working. Include an appropriate unit in your answer.

***Length/magnification = answer, with unit.***

***Answer should either be in standard form or have the correct prefix. 1 mark for correct working with answer***

***1 mark for appropriate unit***

**Next steps:** converting units, drawing a scale, depending depth of teaching.